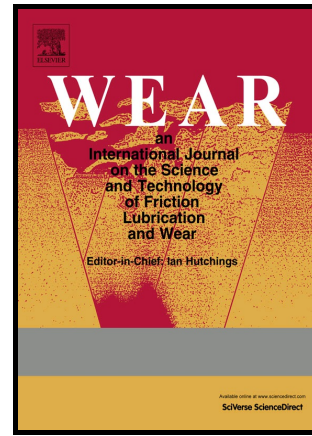


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Tribological performance of laser-patterned chain links – Influence of pattern geometry and periodicity

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Abstract

In this work, we study friction and wear of laser-patterned chain links (42CrMo4 steel) using a specially modified ball-on-disk tribometer under linear reciprocating sliding (normal load of 15 N and sliding velocity of 3 cm/s). The results of the laser-patterned surfaces are compared to the behaviour of polished and serial chain links. Direct laser interference patterning (wavelength of 355 nm and pulse duration of 10 ns) was used to produce homogeneous line- or cross-like patterns with periodicities of 7 and 15 μm as well as a depth of roughly 1 μm . Light microscopy and white light interferometry was utilized to carefully analyse these surfaces and the resulting wear tracks. It could be shown that line-like surface patterns induce a detrimental behaviour regarding the resulting coefficient of friction, whereas cross-like patterns appear to be beneficial in terms of friction and wear reduction. This can be explained by the existence of closed lubrication pockets, which provide a secondary oil effect and build-up an additional hydrodynamic pressure. Furthermore, the findings observed in this work allow for a better understanding of the tribological performance of the serial chain link, mainly induced by a good load-bearing capability.

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